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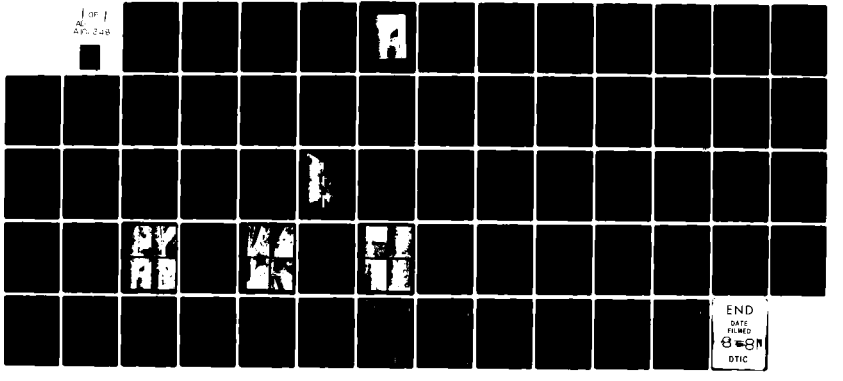

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DELAWARE RIVER BASIN
RAYMONDSKILL CREEK, PIKE COUNTY

PENNSYLVANIA

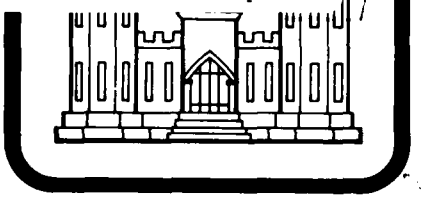
BEAVER LAKE LODGE DAM

NDI I.D. NO. PA-00300
PENNDER I.D. NO. 52-93

MR. WILLIAM B. TROY

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

National Dam Inspection Program. Beaver Lake Lodge Dam (NDI I.D. Number PA-00300, PennDER I.D. Number 52-93), Delaware River Basin, Raymondskill Creek, Pike County, Pennsylvania. Phase I Inspection Report.



PREPARED FOR

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

DACW 31-81-C-0015

PREPARED BY

GAI CONSULTANTS, INC.
570 BEATTY ROAD
MONROEVILLE, PENNSYLVANIA 15146

JUNE 1981

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investi-- gation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the Spillway Design Flood is based on the estimated Probable Maximum Flood (greatest reasonably possible storm runoff) for the region, or fractions thereof. The Spillway Design Flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition, and the downstream damage potential.

Breach analyses are performed, when necessary, to provide data to assess the potential for downstream damage and possible loss of life. The results are based on specific theoretical scenarios peculiar to the analysis of a particular dam and are not applicable to other related studies such as those conducted under the Federal Flood Insurance Program.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

ABSTRACT

Beaver Lake Lodge Dam: NDI I.D. No. PA-00300

Owner:	William B. Troy
State Located:	Pennsylvania (PennDER I.D. No. 52-93)
County Located:	Pike
Stream:	Raymondskill Creek
Inspection Date:	11 November 1980
Inspection Team:	GAI Consultants, Inc. 570 Beatty Road Monroeville, Pennsylvania 15146

Based on a visual inspection, operational history, and hydrologic and hydraulic analysis, the dam is considered to be in poor condition.

The size classification of the facility is small and its hazard classification is considered to be significant. In accordance with the recommended guidelines, the Spillway Design Flood (SDF) for the facility ranges between the 100-year frequency flood and the 1/2 PMF (Probable Maximum Flood). Since the facility is classified near the lower bounds of the small category, the SDF is considered to be 100-year frequency flood. Results of the hydrologic and hydraulic analysis indicate the facility is not capable of passing and/or storing the inflow resulting from a 100-year frequency flood without overtopping the embankment. Consequently, the spillway system at Beaver Lake Lodge Dam is considered to be inadequate.

It is recommended that the owner immediately:

a. Develop a warning system to minimize the potential for loss of life and economic damage downstream of the facility in the event of a dam failure. The system should include provisions for around-the-clock surveillance of the facility during periods of unusually heavy precipitation.

b. Have the spillway system assessed by a registered professional engineer experienced in the design of concrete and hydraulic structures and take remedial measures required to make the system hydraulically adequate and restore its structural integrity.

Beaver Lake Lodge Dam: NDI I.D. No. PA-00300

c. Rehabilitate the drawdown facility and restore its operability, or provide other means for reservoir drawdown.

d. Provide adequate erosion protection along the downstream embankment toe near the service spillway.

e. Remove all trees and their root systems from the embankment crest and slopes and restore the grass cover.

f. Develop formal manuals of maintenance and operations to ensure future proper care of the facility.

GAI Consultants, Inc.

Bernard M. Mihalcin, P.E.

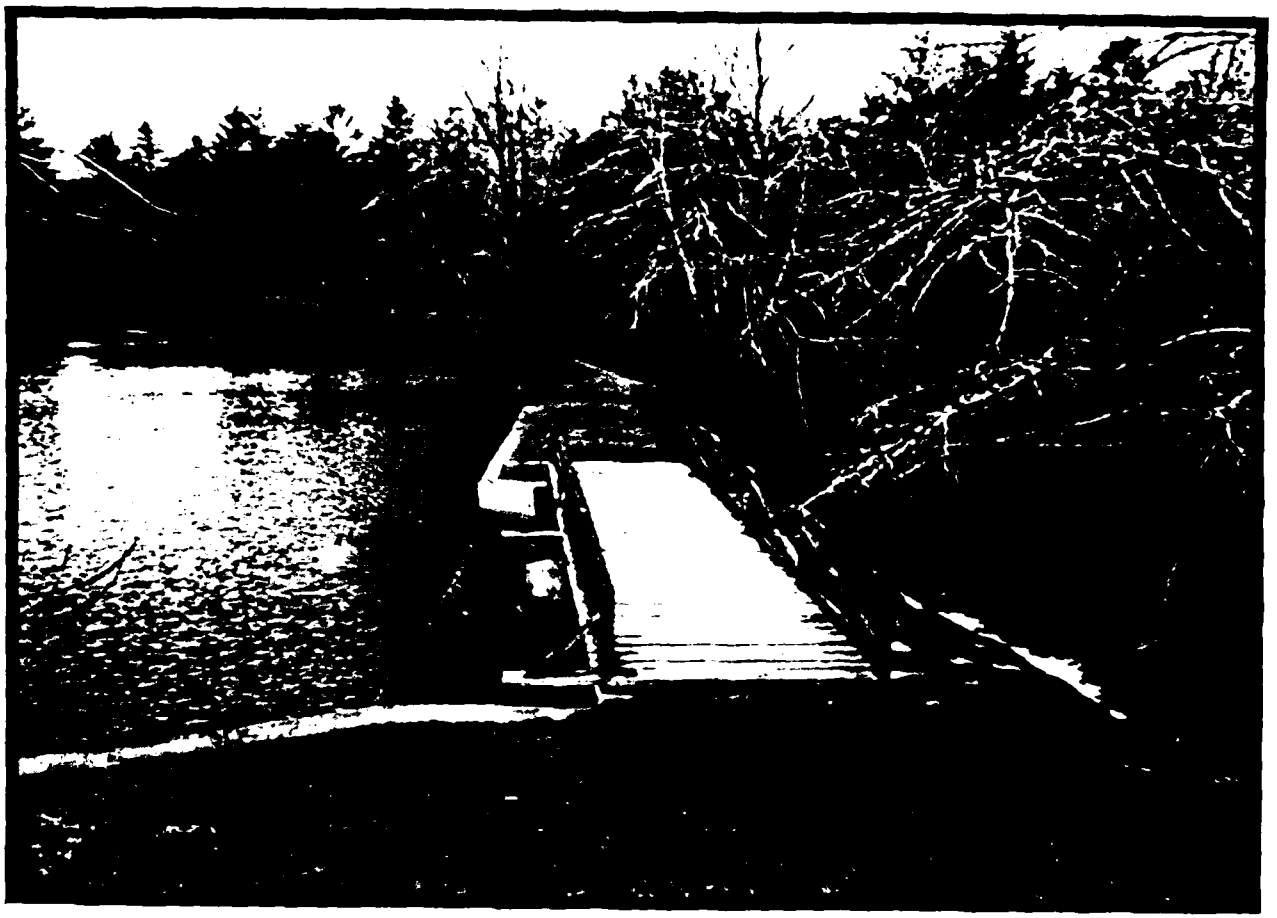
Approved by:

JAMES W. PECK
Colonel, Corps of Engineers
Commander and District Engineer

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
BERNARD M. MIHALCIN
ENGINEER
20371-E

Date 4 June 1981

Date 19 JUNE 1981



OVERVIEW PHOTOGRAPH

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NATIONAL DAM INSPECTION PROGRAM
BEAVER LAKE LODGE DAM
NDI NO. PA-00300, PENNDER NO. 52-93

SECTION 1
GENERAL INFORMATION

1.0 Authority.

The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

1.1 Purpose.

The purpose is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project

a. Dam and Appurtenances. Beaver Lake Lodge Dam is a nine-foot high earth embankment approximately 490 feet long, including service and emergency spillways. The facility is provided with an uncontrolled, rectangular shaped, concrete chute channel service spillway located at the right abutment, and an uncontrolled, rectangular shaped, concrete broad crested, emergency spillway located approximately 325 feet from the right abutment. The outlet works consists of a buried pipe of unknown diameter and composition located in the right abutment to the right of the service spillway. The intake structure consists of a concrete box with a manually operated sluice mechanism. The outlet end of the pipe is apparently submerged in a pool downstream of the embankment.

b. Location. Beaver Lake Lodge Dam is located on Raymondskill Creek in Milford Township, Pike County, Pennsylvania. The facility is situated about three miles southwest of the community of Milford, Pennsylvania. The dam and reservoir are contained in the Milford, Pennsylvania-New Jersey, 7.5 minute U.S.G.S. topographic quadrangle (see Figure 1, Appendix E). The coordinates of the dam are N 41° 18.0' and W74° 51.7'.

c. Size Classification. Small (nine feet high, 122 acre-feet storage capacity at top of dam).

d. Hazard Classification. Significant (see Section 3.1.e).

e. Ownership. Mr. William B. Troy
435 East 52nd Street
Apt. 7A2
New York, New York 10022

f. Purpose. Recreation.

g. Historical Data. Information contained in PennDER files indicates that Beaver Lake Lodge Dam was originally constructed prior to 1931. No design or construction details are available. In 1933, the new owner (Mr. Charles Bonoff) applied for a state permit for extensive repairs and modifications to the existing facility. The original wooden spillway was replaced with a concrete, chute channel, service spillway located at the right abutment and a concrete emergency spillway located to the left of the service spillway. The main embankment was raised by approximately one foot to increase the storage volume.

The facility has remained under control of the Bonoff family and is currently owned by Mr. William B. Troy, a relative of Mr. Charles Bonoff. Mr. Troy stated that minor repair work has been done on the dam and spillway. A full-time property manager resides near the facility.

1.3 Pertinent Data.

a. Drainage Area (square miles). 19.7

b. Discharge at Dam Site.

Discharge Capacity of the Outlet Conduit - Discharge curves are not available.

Discharge Capacity of Spillway at Maximum Pool ≅ 240 cfs (see Appendix D, Sheet 7).

c. Elevations (feet above mean sea level). The following elevations were obtained through field measurements that were based on the approximate elevation of normal pool at 848.0 feet as indicated in Figure 1, Appendix E.

Top of Dam	Not known (design). 849.4 (field).
Downstream Toe of Dam	840.0 (field).
Maximum Design Pool	Not known.
Maximum Pool of Record	Not known.
Normal Pool	848.0
Service Spillway Crest	848.0
Emergency Spillway Crest	848.7
Upstream Inlet Invert	Not known.
Downstream Outlet Invert	Not known.

Streambed at Dam Centerline	Not known.
Maximum Tailwater	Not known.

d. Reservoir length (feet).

Top of Dam	1300
Normal Pool	1100

e. Storage (acre-feet).

Top of Dam	122
Normal Pool	101

f. Reservoir Surface (acres).

Top of Dam	18
Normal Pool	12

g. Dam.

Type	Earth.
Length	490 feet (including spillways).
Height	Nine feet (field measured; embankment crest to downstream embankment toe).
Top Width	Varies; 10 feet minimum to 18 feet maximum.
Upstream slope	1.5H:1V.
Downstream slope	Varies; 10H:1V minimum to 3H:1V maximum.
Zoning	Not known.
Impervious Core	Not known.
Cutoff	Not known.
Grout Curtain	Not known.

h. Diversion Canal and Regulating Tunnels. None.

i.	Service Spillway.	
	Type	Uncontrolled, rectangular shaped, concrete chute channel with a triangular shaped, concrete weir.
	Crest Elevation	848.0 feet.
	Crest Length	35.6 feet.
j.	Emergency Spillway.	Uncontrolled, rectangular shaped, concrete chute channel with a broad crested weir.
	Crest Elevation	848.7 feet.
	Crest Length	38 feet (effective).
k.	Outlet Conduit.	
	Type	Not known.
	Length	Not known.
	Closure and Regulating Facilities	Manually operated single sluice gate located at the the inlet (currently inoperable).
	Access	The conduit control mechanism is accessible by foot along the right abutment.

SECTION 2

ENGINEERING DATA

2.1 Design

a. Design Data Availability and Sources. No design reports, calculations, or formal design data are available. PennDER files contain correspondence and photographs dating back to 1933 that provide information relative to the general history of the facility. No design or construction drawings are available from either the owner or PennDER.

b. Design Features.

1. Embankment. Based strictly on visual observations and field measurements, general statements can be made regarding the embankment design. The embankment is a nine foot high earthen structure approximately 490-feet long, including service and emergency spillways. The upstream slope is set at 1.5H:1V while the downstream slope varies from 10H:1V (minimum) to 3H:1V (maximum). A layer of riprap, partially covered by sod, protects the upstream slope. The embankment crest is generally wide, varying from 10 to 18 feet.

2. Appurtenant Structures.

a) Service Spillway. The service spillway is an uncontrolled, rectangular shaped, concrete chute channel located near the right abutment. Flows through the spillway are regulated by a triangular shaped, concrete weir, 35.6 feet long. The spillway is spanned by a small steel beamed bridge with a wood plank deck. The bridge is supported by the spillway sidewalls and a concrete pier in the center of the channel (see Photographs 1, 2, 3 and 4).

b) Emergency Spillway. The emergency spillway is located approximately 325 feet from the right abutment. It consists of a uncontrolled, rectangular shaped, concrete channel with a concrete, broad crested weir. The spillway weir has a 38-foot effective length and a 14-foot breadth.

c) Outlet Conduit. No information relative to the composition or size of the outlet conduit is available. Inlet and outlet ends of the conduit were submerged at the time of inspection and could not be observed. Originally, the conduit was used to provide flow to a turbine for electric generation. A single sluice gate operated via lever and gear mechanism was used to control the flow (see Photographs 7 and 8). The sluice gate has reportedly not been operated since the mid-1950's.

c. Specific Design Data and Criteria. No formal design data or information relative to design procedures are available.

2.2 Construction Records.

No formal construction records are available for the facility. Construction data is limited to memos and correspondence from PennDER files and a few construction photographs.

2.3 Operational Records.

No formal records of the day-to-day operation of the facility are maintained.

2.4 Other Investigations.

There are no available records concerning formal studies or investigations of Beaver Lake Lodge Dam.

2.5 Evaluation.

There is no formal information available relative to the design and construction of this facility. Information in the form of dated photographs and correspondence contained in PennDER files, in addition to information obtained during the field inspection, are considered sufficient to make a reasonable Phase I assessment of the facility.

SECTION 3

VISUAL INSPECTION

3.1 Observations.

a. General. The visual inspection of the facility suggested that the dam and its appurtenances are in poor condition.

b. Embankment. Observations made during the visual inspection indicate the embankment is in fair condition. The structure is characterized as irregular in both dimension and alignment (see Photographs 1, and 10). The downstream embankment toe is partially inundated by a small pool near the service spillway which has apparently been created for fishing purposes (see Photographs 3, 11 and 12). Some minor erosion was observed along the downstream embankment toe at the water surface near the service spillway. No significant seepage through the downstream embankment face was observed. Field measurements indicate low areas along the embankment crest to the left of the emergency spillway between 0.5 and 1.5 feet below the top of the service spillway bridge. The crest is covered with fragmented rock and grass and the slopes are covered with grass, trees and brush (see Photographs 1, 9 and 10). Trees up to 12 inches in diameter were observed along the upstream and downstream embankment slopes.

c. Appurtenant Structures.

1. Service Spillway. The service spillway is considered to be in poor condition. Excessive concrete deterioration is evident throughout the structure, particularly at the sidewalls and bridge pier. Both sidewalls and the pier are extensively spalled and cracked (see Photographs 3 and 4). Steel plates provided to protect the upstream faces of the sidewalls are becoming dislodged and corroded at normal pool level.

2. Emergency Spillway. The visual inspection revealed that the emergency spillway is in poor condition. The left half of the structure is broken and severely spalled, whereas, the right half is in fair condition (see Photograph 5). The downstream cutoff wall is in a state of disrepair and the concrete is badly deteriorated (see Photograph 6). Slight seepage under the slab and through the downstream cutoff wall was observed. Heavy weed growth was observed in the spillway forebay area. Random boulders dumped adjacent to the downstream cutoff wall have been dislodged (see Photograph 6).

3. Outlet Works. The only visible section of the outlet works is the intake structure and the control mechanism located at the right abutment (see Photographs 7 and 8). The intake structure is dilapidated and currently non-functional. The lever and gear mechanism designed to operate the sluice gate is broken.

d. Reservoir Area. The general area immediately surrounding the reservoir is composed of gentle to moderate slopes that are heavily forested. The watershed area in the immediate vicinity of the reservoir is undeveloped except for a summer cottage near the right abutment. No signs of slope distress were observed.

Several reservoirs and swamps are located within the Beaver Lake Lodge Dam watershed. Three reservoirs are located on Raymondskill Creek or its minor tributaries, and two reservoirs are located on Dwarfskill Creek, a main tributary which joins Raymondskill Creek at Lake Netimus, located approximately one mile upstream of Beaver Lake Lodge Dam. The facilities on Raymondskill Creek are known as Camp Netimus Dam, Pocono Woodland Lake Dam, and Log Tavern Pond. The facilities on Dwarfskill Creek are Crescent Lake Dam and Gold Key Lake. Log Tavern Pond and Gold Key Lake are both natural lakes with no embankments. The individual and cumulative effects of each facility upon the evaluation of Beaver Lake Lodge Dam are presented in Section 5.5.b (see Figure 2).

e. Downstream Channel. Discharges from both spillways at Beaver Lake Lodge Dam flow through a comparatively flat valley for a distance of approximately 1,500 feet, where Raymondskill Creek flows under a local road bridge. The stream has gentle to moderate side slopes in this section. The flat stream gradient combined with the steep side slopes could create backwater at the first obstruction (road bridge). Under severe storms this could inundate the dam area and the guest house located immediately on the stream bank. At a distance of approximately 2,500 feet downstream of the dam, Swale Brook merges with Raymondskill Creek. The creek then flows southwards 1,800 feet into a privately owned recreational facility known as Silver Springs Lake. Discharge from Silver Springs Lake flows into the Delaware River at a distance of 2.5 miles. In this reach the stream flows through the "Raymondskill Falls" and has very steep forested side slopes. At the junction of Highway 209 and Raymondskill Creek, a restaurant is located approximately 100 feet from the creek bank. Due to the presence of the downstream dam at Silver Springs Lake and the possibility of appreciable economic loss, as well as the potential for the loss of a few lives at the downstream structures, the hazard classification for Beaver Lake Lodge Dam is considered to be significant.

3.2 Evaluation.

The overall appearance of the facility suggests it to be in poor condition. Remedial measures are necessary to: 1) repair the deteriorated concrete spillways, 2) remove the trees and overgrowth from the embankment crest and slopes, 3) provide adequate erosion protection along the downstream embankment toe, and 4) restore the operability of the outlet conduit, or provide an alternate means of reservoir drawdown.

SECTION 4

OPERATIONAL PROCEDURE

4.1 Normal Operating Procedure.

Beaver Lake Lodge Dam is essentially a self-regulating facility. Excess inflows are automatically discharged through the uncontrolled spillways. The outlet conduit is presently non-functional and reportedly has not been operated since the mid-1950's. No formal operations manual is available.

4.2 Maintenance of Dam.

Visual observations indicate that maintenance of the dam and its appurtenant structures is presently minimal. No formal maintenance manual is available.

4.3 Maintenance of Operating Facilities.

See Section 4.2 above.

4.4 Warning System.

No formal warning system is presently in effect.

4.5 Evaluation.

Maintenance of the dam and appurtenances appears to be minimal. No means of draining the reservoir is presently available. There are no formal operations or maintenance manuals available for the facility nor is there a formal warning system in effect that could be used to notify the downstream residents should emergency conditions develop at the dam.

SECTION 5

HYDROLOGIC/HYDRAULIC EVALUATION

5.1 Design Data.

No formal design data, calculations, or reports are available. Correspondence found in PennDER files, dated 1933, indicates that state officials recommended a spillway capacity of 3,400 cfs for the reconstructed spillway.

5.2 Experience Data.

Daily records of reservoir levels and/or spillway discharges are not available. The emergency spillway is reported to discharge occasionally, although the dam has reportedly never been overtopped.

5.3 Visual Observations.

Visual observations revealed excessive deterioration of the concrete at both the service and emergency spillways. The present condition of the structures is not expected to adversely affect their operation during a flood event. However, continued deterioration could ultimately lead to the instability of these structures.

5.4 Method of Analysis.

The facility has been analyzed in accordance with the procedures and guidelines established by the U. S. Army, Corps of Engineers, Baltimore District, for Phase I hydrologic and hydraulic evaluations.

5.5 Summary of Analysis.

a. Spillway Design Flood (SDF). In accordance with procedures and guidelines contained in the National Guidelines for Safety Inspection of Dams for Phase I Investigations, the Spillway Design Flood (SDF) for Beaver Lake Lodge Dam ranges between the 100-year frequency flood and the 1/2 PMF (Probable Maximum Flood). This classification is based on the relative size of the dam (small), and the potential hazard of dam failure to downstream developments (significant). Since the facility is classified near the lower bounds of the small category, the SDF is considered to be the 100-year frequency flood.

b. Results of Analysis. Beaver Lake Lodge Dam was evaluated in order to determine if it could accommodate the 100-year frequency flood without overtopping of its embankment. The 100-

year flood peak flow was determined according to methods provided in the "Regional Frequency Study, Upper Delaware and Hudson River Basins, New York District" (see Appendix D, Sheet 4). The peak inflow under this 100-year flood event was determined to be about 3,340 cfs, while the maximum spillway capacity (at the minimum embankment crest elevation) was found to be about 240 cfs. Therefore, it can be concluded that the embankment would be overtopped under the 100-year flood event, based on the assumption of little or no attenuation of the peak inflow (no hydrograph routing was performed in this analysis; see Appendix D, Sheets 6 through 8). Also, should the embankment crest be regraded to the elevation of the top of the spillway bridge at 851.5 feet, the maximum spillway capacity would be about 1,230 cfs, and the embankment would still be subject to overtopping under the 100-year flood event.

5.6 Spillway Adequacy

As presented above, Beaver Lake Lodge Dam cannot accommodate the 100-year frequency flood (the SDF) without overtopping of its embankment. However, since its hazard category is considered to be significant, no breaching analysis was performed, in accordance with Corps directive ETL-1110-2-234. Thus, as Beaver Lake Lodge Dam cannot accommodate its SDF, its spillway is considered to be inadequate.

SECTION 6

EVALUATION OF STRUCTURAL INTEGRITY

6.1 Visual Observations.

a. Embankment. The conditions observed during the field inspection suggest the embankment is in fair condition. The following deficiencies were noted at the time of inspection and will require the owner's attention. They include:

- Portions of the embankment are approximately 1.5 feet below the elevation of the top of the service spillway bridge.
- A portion of downstream embankment toe near the service spillway is unprotected and subject to further erosion.
- The roots of trees growing along the upstream and downstream embankment slopes may increase the seepage potential through the embankment. Furthermore, uprooting of the trees by high winds could cause substantial volumes of the embankment material to be displaced. Hence, the trees and their root system should be removed.

b. Appurtenant Structures.

1. Service Spillway. The service spillway is in poor condition. The concrete structure is badly deteriorated, as evidenced by extensive spalling, scaling and deep structural cracking. The steel plates provided for upstream face protection are becoming dislodged and are corroded at the normal pool level. Although the spillway is functional at present, extensive repairs are necessary.

2. Emergency Spillway. The emergency spillway is in poor condition. The left half of the structure is badly deteriorated, as evidenced by extensive spalling, scaling and deep structural cracking. The downstream cutoff wall is in a state of disrepair and the dumped rock adjacent to the cutoff wall has been displaced. The approach channel is partially obstructed with heavy overgrowth in the forebay area.

3. Outlet Works. The outlet works have not been operated since the mid-1950's and the mechanism provided for operating the sluice gate is broken. The concrete walls of the intake structure are cracked and deteriorated and require repair.

6.2 Design and Construction Techniques.

No information is available that details the methods of design and/or construction.

6.3 Past Performance.

No records relative to performance history of this facility are available. The owner's representative stated, however, that the embankment had never been overtopped to his knowledge.

6.4 Seismic Stability.

The dam is located within Seismic Zone No. 1 and may be subject to minor earthquake induced dynamic forces. The facility is presently considered to be stable and it is believed that, if static conditions continue to be satisfied, the dam can withstand the expected minor dynamic forces. However, no calculations or investigations were performed to confirm this opinion.

SECTION 7

ASSESSMENT AND RECOMMENDATIONS FOR REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety. The results of this investigation indicate the facility is in poor condition.

The size classification of the facility is small and its hazard classification is considered to be significant. In accordance with the recommended guidelines, the Spillway Design Flood (SDF) for the facility ranges between the 100-year frequency flood and the 1/2 PMF (Probable Maximum Flood). Since the facility is classified near the lower bounds of the small category, the SDF is considered to be the 100-year frequency flood. Results of the hydrologic and hydraulic analysis indicate the facility is not capable of passing and/or storing the inflow from a 100-year frequency flood event without overtopping the embankment. Consequently, the spillway system at Beaver Lake Lodge Dam is considered to be inadequate.

b. Adequacy of Information. The available data is considered sufficient to make a reasonable Phase I assessment of the facility.

c. Urgency. The recommendations listed below should be implemented immediately.

d. Necessity for Additional Investigation. Additional investigations to assess the structural integrity of the spillway system are deemed necessary, as recommended below.

7.2 Recommendations/Remedial Measures

a. Develop a warning system to minimize the potential for loss of life and economic damage downstream of the facility in the event of a dam failure. The system should include provisions for around-the-clock surveillance during periods of unusually heavy precipitation and a communication plan with the downstream residents.

b. Have the spillway system assessed by a registered professional engineer experienced in the design of concrete and hydraulic structures and take remedial measures required to make the system hydraulically adequate and restore its structural integrity.

c. Rehabilitate the drawdown facility and restore its operability, or provide other means for reservoir drawdown.

d. Provide adequate erosion protection along the downstream embankment toe near the service spillway.

e. Remove all trees and their root systems from the embankment crest and slopes and restore the grass cover.

f. Develop formal manuals of maintenance and operations to ensure future proper care of the facility.

APPENDIX A

VISUAL INSPECTION CHECKLIST AND FIELD SKETCHES

CHECK LIST
VISUAL INSPECTION
PHASE 1

NAME OF DAM Beaver Lake Lodge Dam STATE Pennsylvania COUNTY Pike

NDI # PA — 00300 PENNDER # 52-93

TYPE OF DAM Earth SIZE Small HAZARD CATEGORY Significant

DATE(S) INSPECTION 11 November 1980 WEATHER Cold TEMPERATURE 28° @ 8:30 am

POOL ELEVATION AT TIME OF INSPECTION 848.1 feet M.S.L.

TAILWATER AT TIME OF INSPECTION Approximately 842 feet M.S.L.

INSPECTION PERSONNEL	OWNER REPRESENTATIVES	*OTHERS*
B. M. Mihalcin	W. Findlay - Property Manager	
D. J. Spaeder	(Present at pre-inspection inter-	
K. H. Khilji	view only)	

RECORDED BY B. M. Mihalcin

EMBANKMENT

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA. 00300
SURFACE CRACKS	None observed. The embankment crest appears to be covered with rock fragments and sod.
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed. Area along the downstream embankment toe is inundated with backwater discharged from the service and emergency spillways.
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Some erosion evident along downstream embankment toe to the left of the service spillway.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Horizontal - Curved embankment. Upstream edge is good. Crest width is irregular. Vertical - see "Profile of Dam Crest from Field Survey", Appendix A.
RIPRAP FAILURES	No apparent riprap failures. Riprap is partially covered with sod, but, appears adequate.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Embankment-abutment junctions are in good condition with no erosion noted. Emergency spillway sidewalls are lower than the embankment crest, but, no erosion is evident.

EMBANKMENT

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA - 00300
DAMP AREAS IRREGULAR VEGETATION (LUSH OR DEAD PLANTS)	No damp areas were observed along the downstream embankment face.
ANY NOTICEABLE SEEPAGE	None through the downstream embankment face. Slight seepage observed beneath the floor slab of emergency spillway - not significant.
STAFF GAGE AND RECORDER	None.
DRAINS	None observed.
VEGETATION	Upstream edge of embankment crest is lined with trees and shrubs. Five large maple trees (≈ 12 inches in diameter) are situated near the service spillway. Many sizeable pine trees were observed along the downstream embankment face.

OUTLET WORKS

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA- 00300
INTAKE STRUCTURE	Concrete sluice mechanism located at the right abutment. Concrete walls are cracked and deteriorated.
OUTLET CONDUIT (CRACKING AND SPALLING OF CONCRETE SURFACES)	Buried and inundated pipe - not observed. Outlet conduit had been formerly used to operate an electric generator. Generator house has since been dismantled. Exact location of outlet discharge is not known at present.
OUTLET STRUCTURE	None observed. Outlet is probably submerged in the pool along the downstream embankment toe.
OUTLET CHANNEL	Discharges into the tailwater pool along the downstream embankment toe.
GATE(S) AND OPERATIONAL EQUIPMENT	Single sluice gate located at the outlet conduit inlet to the right of the service spillway. Operation of the gear mechanism is manual by lever. Reportedly, the conduit has not been operated since the mid-1950's.

EMERGENCY SPILLWAY

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA - 00300
TYPE AND CONDITION	Uncontrolled, rectangular shaped, concrete channel with a broad crested, concrete overflow weir. Poor condition. Severe spalling and cracking observed along the weir.
APPROACH CHANNEL	Rock lined. Approach area is obstructed by thick grass-like vegetation in the spillway forebay immediately adjacent to the upstream face of the overflow weir.
SPILLWAY CHANNEL AND SIDEWALLS	Channel floor (weir) in poor condition with severe spalling and cracking evident particularly along its left side. Downstream cutoff wall in disrepair with slight leakage evident. Spillway sidewalls are in fair condition.
STILLING BASIN PLUNGE POOL	Small boulder filled basin located immediately beyond the weir.
DISCHARGE CHANNEL	Rock lined, natural channel - unobstructed.
BRIDGE AND PIERS EMERGENCY GATES	None.

SERVICE SPILLWAY

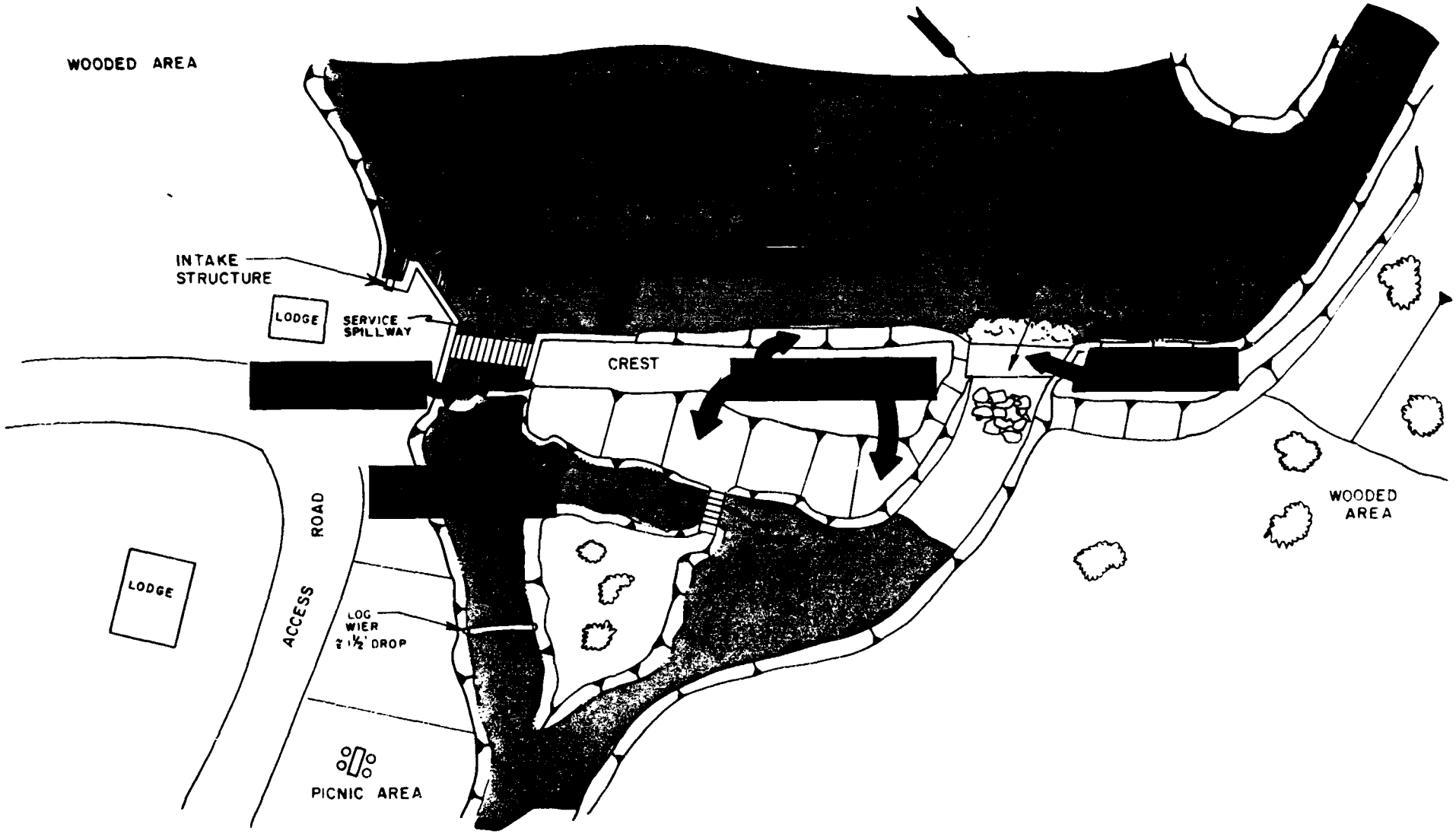
ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA - 00300
TYPE AND CONDITION	Uncontrolled, rectangular shaped, concrete chute channel with a triangular shaped weir. Overall condition is poor.
APPROACH CHANNEL	Rock lined - unobstructed.
OUTLET STRUCTURE	N/A.
DISCHARGE CHANNEL	The spillway discharges into a small pool that inundates the area along the downstream embankment toe. Spillway discharges may be causing the minor erosion observed along the downstream embankment toe to the left of the service spillway.
CHANNEL FLOOR AND SIDEWALLS	Downstream end of channel floor is cracked and possibly undercut and in poor condition. Concrete sidewalls are severely spalled as is the center bridge pier.
BRIDGE AND PIERS	Steel beamed bridge with a wood deck in good condition. As previously stated however, the spillway sidewalls and bridge pier that support the structure are in poor condition.

INSTRUMENTATION

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA - 00300
MONUMENTATION SURVEYS	None observed.
OBSERVATION WELLS	None.
WEIRS	None.
PIEZOMETERS	None.
OTHERS	None.

RESERVOIR AREA AND DOWNSTREAM CHANNEL

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA - 00300
SLOPES: RESERVOIR	Gentle to moderate slopes that are heavily forested.
SEDIMENTATION	None apparent.
DOWNSTREAM CHANNEL (OBSTRUCTIONS, DEBRIS, ETC.)	Channel passes through the local road culverts between Beaver Lake Lodge Dam and Silver Spring Lake located about 4500 feet downstream.
SLOPES: CHANNEL VALLEY	Gentle stream gradient set in a partially wooded valley with gentle to moderate confining slopes between dam and Silver Spring Lake. Channel slope becomes steep and valley narrows downstream of Silver Spring Lake.
APPROXIMATE NUMBER OF HOMES AND POPULATION	Significant hazard - potential for appreciable economic loss. (see Section 3.1.e).

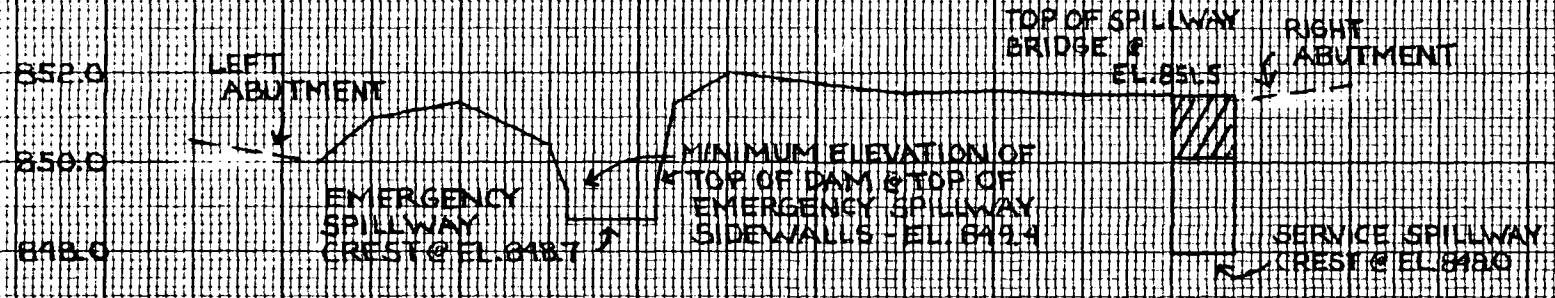


BEAVER LAKE LODGE DAM
GENERAL PLAN-FIELD INSPECTION NOTES

NDI # PA-00300

BEAVER LAKE LODGE DAM

PROFILE OF DAM CREST
FROM FIELD SURVEY



SCALE:
VERTICAL: 1 IN. = 4 FT
HORIZONTAL: 1 IN. = 100 FT

SUBJECT: BEAVER LAKE LODGE DAM
BY: WD DATE: 9-7-81 SHEET NO. OF
CHKD. BY: DLA DATE: 9-11-81 PROJECT NO. 80-238-300

APPENDIX B

ENGINEERING DATA CHECKLIST

CHECK LIST
ENGINEERING DATA
PHASE I

NAME OF DAM Beaver Lake Lodge Dam

ITEM	REMARKS NDI# PA - 00300
PERSONS INTERVIEWED AND TITLE	William Findlay - Property Manager (since 1957) - resides at the site and is employed by the owner, William B. Troy of New York, New York.
REGIONAL VICINITY MAP	See Figures 1 and 2, Appendix E.
CONSTRUCTION HISTORY	Built prior to 1931.
AVAILABLE DRAWINGS	None available. Several drawings contained in PennDER files do not even remotely depict as-built conditions and are considered to be useless.
TYPICAL DAM SECTIONS	None available.
OUTLETS: PLAN DETAILS DISCHARGE RATINGS	None available.

CHECK LIST
ENGINEERING DATA
PHASE I
(CONTINUED)

ITEM	REMARKS NDI# PA - 00300
SPILLWAY: PLAN SECTION DETAILS	None available.
OPERATING EQUIP- MENT PLANS AND DETAILS	Sluice gate (lever operated) with outlet pipe buried in right abutment. Apparently discharges into pool downstream of spillway, although its discharge end was not observed.
DESIGN REPORTS	None available.
GEOLOGY REPORTS	None available.
DESIGN COMPUTATIONS: HYDROLOGY AND HYDRAULICS STABILITY ANALYSES SEEPAGE ANALYSES	None available.
MATERIAL INVESTIGATIONS: BORING RECORDS LABORATORY TESTING FIELD TESTING	None available.

CHECK LIST
ENGINEERING DATA
PHASE I
(CONTINUED)

ITEM	REMARKS NDI# PA - 00300
BORROW SOURCES	Not known.
POST CONSTRUCTION DAM SURVEYS	None.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None.
HIGH POOL RECORDS	Reportedly the Dam has never been overtopped. Emergency spillway reportedly discharges on occasion.
MONITORING SYSTEMS	None.
MODIFICATIONS	Minor repairs only.

CHECK LIST
ENGINEERING DATA
PHASE I
(CONTINUED)

ITEM	REMARKS	NDI# PA - 00300
PRIOR ACCIDENTS OR FAILURES	None.	
MAINTENANCE: RECORDS MANUAL	None.	
OPERATION: RECORDS MANUAL	None.	
OPERATIONAL PROCEDURES	Self-regulating.	
WARNING SYSTEM AND/OR COMMUNICATION FACILITIES	None presently. Caretaker knew several downstream residents.	
MISCELLANEOUS		

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

NDI ID # PA-00300
PENNDER ID # 52-93

SIZE OF DRAINAGE AREA: 2.4 square miles (local); 19.7 square miles (total).

ELEVATION TOP NORMAL POOL: 848.0 STORAGE CAPACITY: 101 acre-feet.

ELEVATION TOP FLOOD CONTROL POOL: - STORAGE CAPACITY: -

ELEVATION MAXIMUM DESIGN POOL: - STORAGE CAPACITY: -

ELEVATION TOP DAM: 849.4 (field). STORAGE CAPACITY: 122 acre-feet.

SPILLWAY DATA

CREST ELEVATION: 848.0 feet (service); 848.7 feet (emergency).

TYPE: Uncontrolled, rectangular, concrete channels (service & emergency).

CREST LENGTH: 35.6 feet (service); 38 feet (emergency).

CHANNEL LENGTH: 25 feet (service); 14 feet (emergency).

SPILLOVER LOCATION: Right abutment (service); near left abutment (emergency).

NUMBER AND TYPE OF GATES: None.

OUTLET WORKS

TYPE: Size and composition of conduit is not known.

LOCATION: Right of the service spillway.

ENTRANCE INVERTS: Not known.

EXIT INVERTS: Not known.

EMERGENCY DRAWDOWN FACILITIES: Single sluice gate at inlet.

HYDROMETEOROLOGICAL GAGES

TYPE: None.

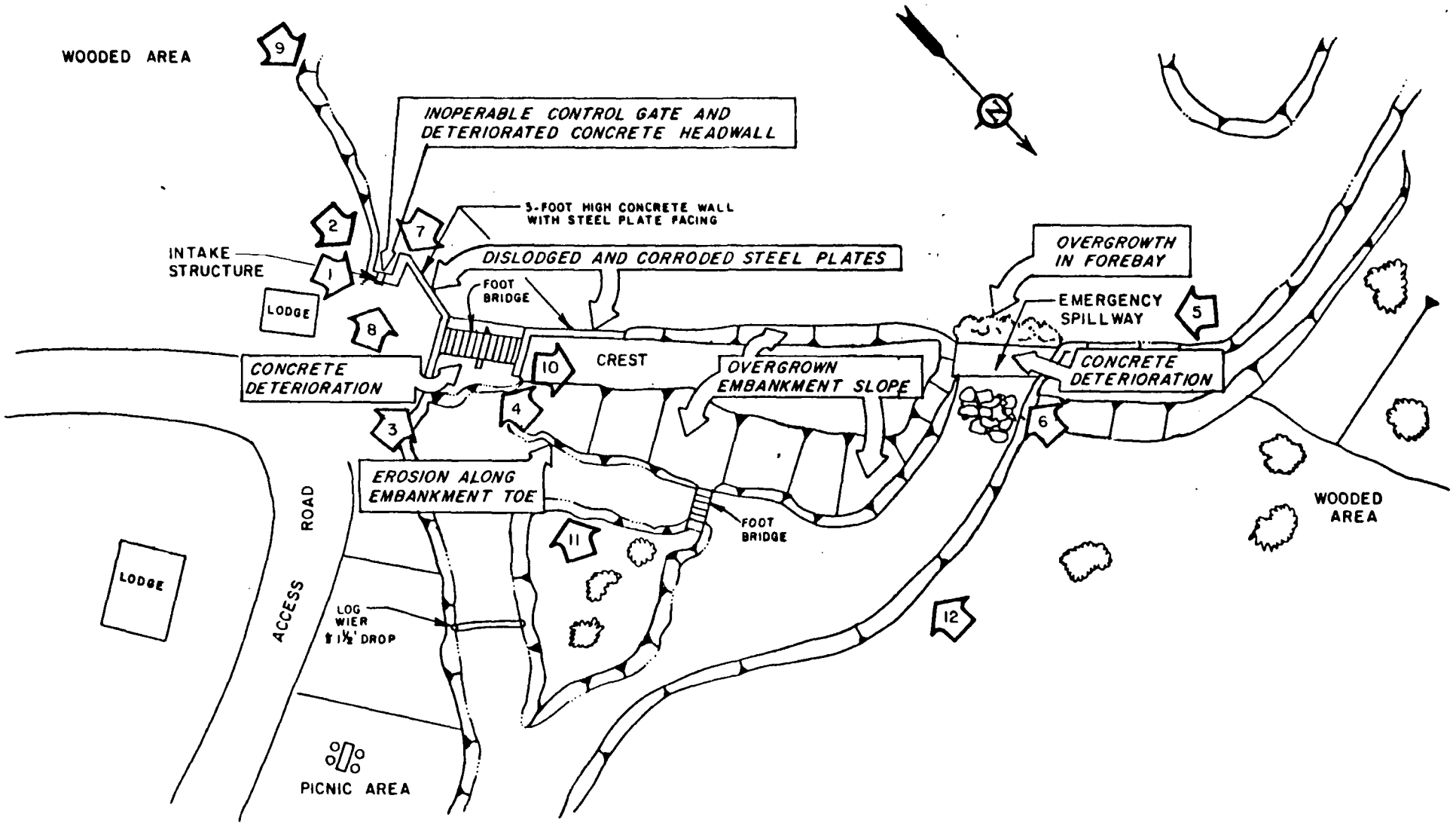
LOCATION: -

RECORDS: -

MAXIMUM NON-DAMAGING DISCHARGE: Not known.

APPENDIX C

PHOTOGRAPHS



BEAVER LAKE LODGE DAM
PHOTOGRAPH KEY MAP

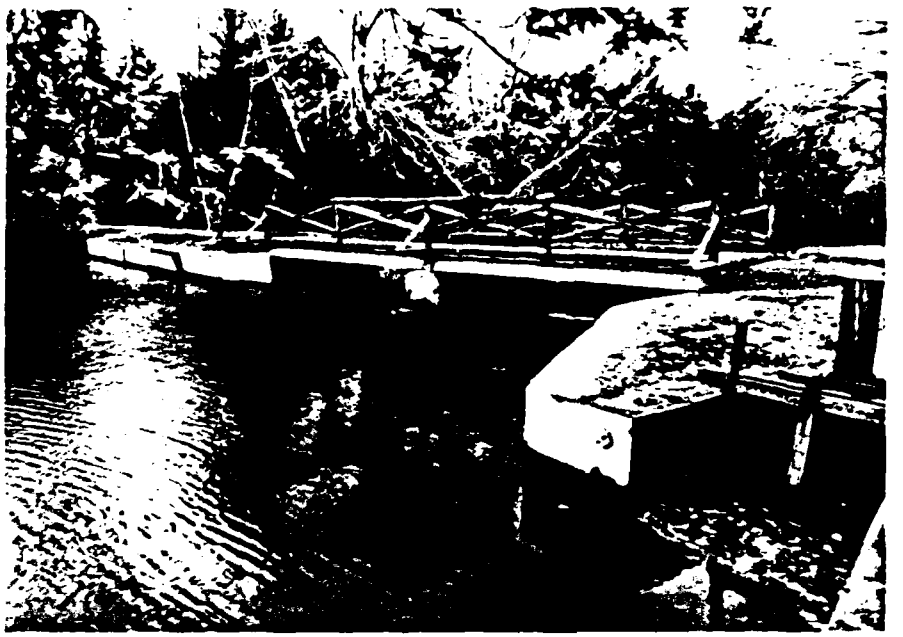
PHOTOGRAPH 1 View across the embankment crest looking towards the left abutment.

PHOTOGRAPH 2 View showing the entry channel of the service spillway.

PHOTOGRAPH 3 View of the service spillway looking upstream. Note the broken bottom slab.

PHOTOGRAPH 4 View of the service spillway showing deterioration of concrete pier and sidewall.

1



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PHOTOGRAPH 5 View of emergency spillway looking towards the right abutment. Note the brush growth in the entry channel.

PHOTOGRAPH 6 View of the downstream end of the emergency spillway. Note the erosion and broken cutoff wall.

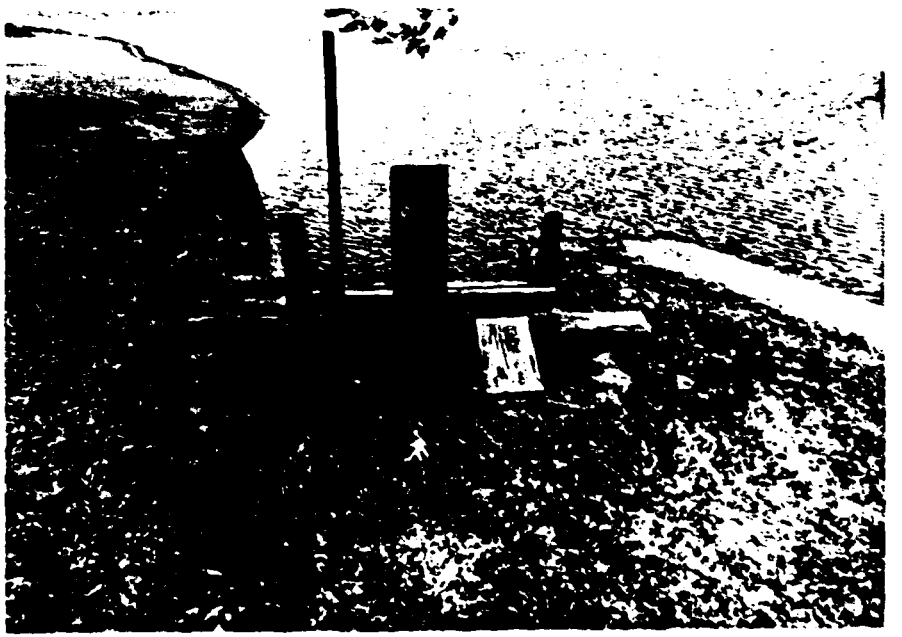
PHOTOGRAPH 7 View of intake structure (inoperable sluice gate). Note broken concrete wall.

PHOTOGRAPH 8 View of the sluice gate lever and gear mechanism (inoperable).

5

6

7



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PHOTOGRAPH 9 View of e upstream embankment face.

PHOTOGRAPH 10 View of the embankment crest looking towards left abutment. Note the trees on upstream and downstream faces.

PHOTOGRAPH 11 View showing undercutting of the downstream slope of the embankment near the service spillway.

PHOTOGRAPH 12 View of the pool along the downstream toe of the embankment.

9

10

11

12

APPENDIX D

HYDROLOGIC AND HYDRAULIC ANALYSES

SUBJECT DAM SAFETY INSPECTION
BEAVER LAKE LODGE DAM

BY DJS DATE 3-31-81 PROJ. NO. 80-238-300

CHKD. BY DGB DATE 5-11-81 SHEET NO. 1 OF 8

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DAM STATISTICS

HEIGHT OF DAM = 9 FT (FIELD MEASURED – TOP OF DAM TO DOWNSTREAM EMBANKMENT TOE; "TOP OF DAM" HERE AND ON ALL SUBSEQUENT CALCULATION SHEETS REFERS TO THE LOW AREA IN THE EMBANKMENT CREST.)

NORMAL POOL STORAGE CAPACITY = 33×10^6 GALLONS
≅ 101 AC-FT (SEE NOTE 1)

MAXIMUM POOL STORAGE CAPACITY = 122 AC-FT (SHEET 3)
(@ TOP OF DAM)

DRAINAGE AREA:

SUBAREA	LOCAL D.A. (SQ. MI.)	CUMULATIVE D.A. (SQ. MI.)
GOLD KEY LAKE	1.5	—
CRESCENT LAKE	4.6	6.1
LOG TAVERN LAKE	0.8	—
POND WOODLAND LAKE	0.3	—
CAMP NETIMUS LAKE	10.1	17.3
BEAVER LAKE	2.4	19.7

(PLANIMETERED ON USGS TOPO QUADS – MILFORD, EDGEMERE, AND SHOHOLA, PA)

NOTE 1: OBTAINED FROM WATER RESOURCES INVENTORY FOR BEAVER LAKE DAM, ID # 90-52-93, FOUND IN PENN DER FILES.

SUBJECT DAM SAFETY INSPECTION
BEAVER LAKE LODGE DAM

BY DJS DATE 4-1-81 PROJ. NO. 80-238-300

CHKD. BY DLB DATE 5-11-81 SHEET NO. 2 OF 8

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ELEVATIONS:

TOP OF DAM (DESIGN)	= UNKNOWN	
TOP OF DAM (FIELD)	= 849.4	
NORMAL POOL	= 848.0	(USGS TOPO QUAD - MILFORD, PA)
SERVICE SPILLWAY CREST	= 848.0	
EMERGENCY SPILLWAY CREST	= 848.7	
UPSTREAM INLET INVERT (DESIGN)	= UNKNOWN	
DOWNSTREAM OUTLET INVERT (DESIGN)	= UNKNOWN	
DOWNSTREAM OUTLET INVERT (FIELD)	= UNKNOWN	
DOWNSTREAM EMBANKMENT TOE (FIELD)	= 840.0	
STREAMBED @ DAM CENTERLINE	= UNKNOWN	

DAM CLASSIFICATION

DAM SIZE: SMALL (REF 1, TABLE 1)

HAZARD CLASSIFICATION: SIGNIFICANT (FIELD OBSERVATION)

REQUIRED SDF: 100 YEAR FLOOD TO ½ PMF (REF 1, TABLE 3)

SELECTED SDF = 100-YEAR FLOOD.

SUBJECT DAM SAFETY INSPECTION
BEAVER LAKE LODGE DAM

BY DJS DATE 5-7-81 PROJ. NO. 80-238-300

CHKD. BY DLB DATE 5-11-81 SHEET NO. 3 OF 8

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RESERVOIR CAPACITY

RESERVOIR SURFACE AREAS:

- SURFACE AREA (S.A.) @ NORMAL POOL (EL. 848.0) = 12 ACRES
- S.A. @ EL. 860.0 = 61 ACRES

(PLANIMETERED ON USGS TOPO QUAD - MILFORD, PA)

- S.A. @ TOP OF DAM (EL. 849.4) = 17.7 ACRES

(BY LINEAR INTERPOLATION)

VOLUME @ NORMAL POOL = 101 AC-FT (SEE SHEET 1)

— CALCULATE VOLUME @ TOP OF DAM:

USING THE MODIFIED PRISMOIDAL RELATIONSHIP

$$\Delta V_{1-2} = \frac{h}{3}\left(A_1 + A_2 + \sqrt{A_1 \cdot A_2}\right)$$ (REF. 14, P. 15)

WHERE ΔV_{1-2} = INCREMENTAL VOLUME BETWEEN ELEVATIONS 1 & 2, IN AC-FT,
h = ELEVATION 1 − ELEVATION 2, IN FT,
A_1 = S.A. @ ELEV 1, IN AC.,
A_2 = S.A. @ ELEV 2, IN AC.

AT ELEV. 849.4,

$$\text{VOLUME} = 101 + \frac{1.4}{3}\left(12 + 17.7 + \sqrt{12 \times 17.7}\right)$$
$$= 121.7 \text{ AC-FT.}$$

∴ STORAGE CAPACITY @ TOP OF DAM = 122 AC-FT.

SUBJECT DAM SAFETY INSPECTION
BEAVER LAKE LODGE DAM

BY DJS DATE 5-7-81 PROJ. NO. 80-238-300

CHKD. BY DLB DATE 5-11-81 SHEET NO. 4 OF 8

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100-YEAR FLOOD COMPUTATION

THE FOLLOWING DATA AND METHODOLOGY WERE TAKEN FROM THE "REGIONAL FREQUENCY STUDY, UPPER DELAWARE AND HUDSON RIVER BASINS, NEW YORK DISTRICT;" PREPARED FOR THE NEW YORK DISTRICT, CORPS OF ENGINEERS BY THE HYDROLOGIC ENGINEERING CENTER, DAVIS, CALIFORNIA, NOVEMBER 1974.

COMPUTE THE 100-YEAR FLOOD PEAK FOR BEAVER LAKE LODGE DAM:

1) COMPUTE MEAN LOG OF ANNUAL PEAK DISCHARGE:

$$\text{LOG}(Q_m) = C_m + 0.87\ \text{LOG}(A)$$

WHERE Q_m = GEOMETRIC MEAN OF ANNUAL FLOOD PEAKS, IN CFS,
C_m = MAP COEFFICIENT,
A = DRAINAGE AREA = 19.7 SQUARE MILES (SHEET 1).

FROM FIG 2, "REGIONAL FREQUENCY STUDY,"

$$C_m = 1.6$$

$$\therefore \quad \text{LOG}(Q_m) = 1.6 + 0.87\,\text{LOG}(19.7)$$
$$= 2.726$$

2) COMPUTE STANDARD DEVIATION:

$$S = C_s - 0.05\ \text{LOG}(A)$$

WHERE S = STANDARD DEVIATION OF LOGARITHMS OF ANNUAL PEAKS,
C_s = MAP COEFFICIENT FOR STANDARD DEVIATION.

SUBJECT DAM SAFETY INSPECTION
BEAVER LAKE LODGE DAM

BY DJS DATE 5-7-81 PROJ. NO. 80-238-300

CHKD. BY DLB DATE 5-11-81 SHEET NO. 5 OF 6

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FROM FIG. 3, "REGIONAL FREQUENCY STUDY,"

$$C_s = 0.34$$

$$\therefore \quad S = 0.34 - 0.05 \log (19.7)$$
$$= 0.275$$

3) COMPUTE 100-YEAR FLOOD PEAK:

$$\log (Q(P)) = \log (Q_m) + K(P, g) \cdot S$$

WHERE $\log (Q(P))$ = LOG. OF ANNUAL FLOOD PEAKS FOR A GIVEN EXCEEDANCE FREQUENCY (P),

$\log (Q_m)$ = MEAN LOG. OF ANNUAL FLOOD PEAKS,

$K(P, g)$ = MAGNITUDE IN STANDARD DEVIATIONS FROM MEAN FOR A GIVEN EXCEEDANCE FREQUENCY PERCENTAGE (P) AND SKEW COEFFICIENT (g).

S = STANDARD DEVIATION OF LOGS OF ANNUAL FLOOD PEAKS.

FROM FIG. 5, "REGIONAL FREQUENCY STUDY,"

$$g = +0.8.$$

FOR 100-YEAR EVENT, $P = 1.0$ PERCENT

FROM TABLE 10, "REGIONAL FREQUENCY STUDY,"

$$K(1.0, 0.8) = 2.90$$

$$\therefore \quad \log(Q_1) = 2.726 + (2.90)(0.275)$$
$$= 3.5235$$

$$Q_1 = \underline{\underline{3340}} \text{ CFS} = 100\text{-YR FLOOD PEAK.}$$

SUBJECT DAM SAFETY INSPECTION
BEAVER LAKE LODGE DAM

BY DJS DATE 5-8-81 PROJ. NO. 80-238-200

CHKD. BY DLB DATE 5-11-81 SHEET NO. 6 OF 8

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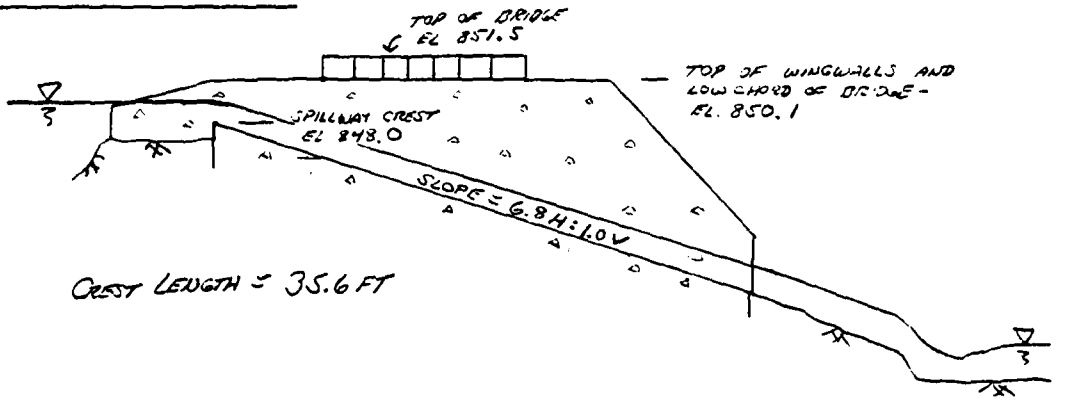
SPILLWAY CAPACITY

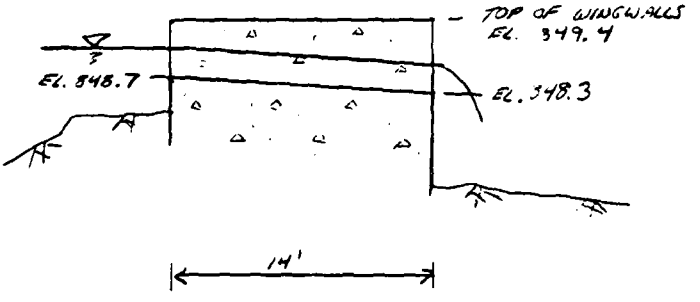
1.) SERVICE SPILLWAY



CREST LENGTH = 35.6 FT

(NOT TO SCALE)

a.) EMERGENCY SPILLWAY



EFFECTIVE CREST LENGTH = 38 FT

(NOT TO SCALE)

- SKETCHES BASED ON FIELD SURVEY.

THE SERVICE SPILLWAY CONSISTS OF A RECTANGULAR SHAPED CONCRETE CHUTE CHANNEL, WITH DISCHARGES REGULATED BY A TRIANGULAR SHAPED WEIR. THE EMERGENCY SPILLWAY CONSISTS OF BROAD-CRESTED CONCRETE WEIR WHICH DISCHARGES INTO A ROCK-LINED CHANNEL.

SUBJECT DAM SAFETY INSPECTION
BEAVER LAKE LODGE DAM

BY DJS DATE 5-8-81 PROJ. NO. 80-238-300

CHKD. BY DLB DATE 5-11-81 SHEET NO. 7 OF 8

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DISCHARGE OVER EACH OF THE WEIRS CAN BE ESTIMATED BY THE RELATIONSHIP

$$Q \simeq CLH^{3/2} \qquad \text{(REF 5, p. 5-3)}$$

WHERE Q = DISCHARGE, IN CFS,
C = COEFFICIENT OF DISCHARGE,
L = WEIR LENGTH, IN FT,
H = HEAD, IN FT.

ASSUME THAT THE DISCHARGE COEFFICIENT IS ON THE ORDER OF 3.0 FOR THE SERVICE SPILLWAY AS WELL AS FOR THE EMERGENCY SPILLWAY (REF 5, TABLES 5-5 — 5-7).

AT EL. 849.4 (MIN. ELEVATION ALONG EMBANKMENT CREST),

$$Q_{TOTAL} = Q_{SERVICE} + Q_{EMERGENCY}$$
$$= (3.0)(35.6)(849.4-848.0)^{3/2} + (3.0)(38.0)(849.4-848.7)^{3/2}$$
$$= \underline{240} \text{ CFS}$$

AT EL. 851.5 (TOP OF SPILLWAY BRIDGE),

$$Q_{TOTAL} = (3.0)(35.6)(3.5)^{3/2} + (3.0)(38)(2.8)^{3/2}$$
$$= \underline{1230} \text{ CFS}$$

SUBJECT DAM SAFETY INSPECTION
BEAVER LAKE LODGE DAM

BY DJS DATE 5-8-81 PROJ. NO. 80-238-300

CHKD. BY DLB DATE 5-11-81 SHEET NO. 8 OF 8

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IN COMPARING THE 100-YR FLOOD PEAK (3340 CFS) WITH THE TOTAL SPILLWAY CAPACITY AT THE TOP OF THE DAM (240 CFS) IT IS SEEN THE DAM WILL BE OVERTOPPED BY THE 100-YEAR FLOOD. IF THE EMBANKMENT CREST WERE REGRADED TO THE ELEVATION OF THE TOP OF THE SPILLWAY BRIDGE (EL 851.5), THE MAXIMUM SPILLWAY CAPACITY WOULD BE ABOUT 1230 CFS, AND THE DAM WOULD STILL BE SUBJECT TO OVERTOPPING UNDER THE 100-YEAR EVENT. IT WAS ASSUMED HERE THAT THERE WOULD BE NO SIGNIFICANT ATTENUATION OF THE 100-YEAR FLOOD, IN SPITE OF THE FACT THAT THERE ARE UPSTREAM DAMS AND NATURAL LAKES. THIS ASSUMPTION WAS BASED ON THE FACT THAT THERE WAS LITTLE OR NO ATTENUATION OF FLOOD PEAKS AT THE UPSTREAM CRESCENT LAKE DAM (SEE NOTE 2). SINCE CAMP METIMUS DAM (FIG. 2) AND BEAVER LAKE LODGE DAM ARE APPROXIMATELY IN THE SAME SIZE RANGE AS CRESCENT LAKE DAM, IT CAN BE ASSUMED THAT THERE WOULD BE NO SIGNIFICANT ATTENUATION OF THE FLOOD PEAKS AT THESE FACILITIES. ALSO, ALTHOUGH GOLD KEY LAKE AND LOG TAVERN POND (FIG. 2) ARE NATURAL LAKES WITH LARGE STORAGE CAPACITIES, THESE FACILITIES ARE LOCATED IN THE UPPERMOST REACHES OF THE WATERSHED, AND THUS WILL HAVE LITTLE EFFECT ON THE PEAK FLOWS ENTERING BEAVER LAKE. FINALLY, POCONO WOODLAND LAKE DAM (NDI No. PA-00443, DER No. 52-179), FOR WHICH A PHASE I INSPECTION REPORT IS CURRENTLY BEING PREPARED, HAS A RELATIVELY SMALL DRAINAGE AREA (0.3 SQUARE MILES; SEE FIG. 2), AND THUS WILL HAVE LITTLE EFFECT ON BEAVER LAKE INFLOWS. THEREFORE, IT IS CONCLUDED THAT BEAVER LAKE LODGE DAM WILL BE OVERTOPPED UNDER THE 100-YEAR EVENT.

NOTE 2: FROM "PHASE I INSPECTION REPORT, NATIONAL DAM INSPECTION PROGRAM, CRESCENT LAKE DAM," NDI No. PA-00413, DER No. 52-142, PREPARED BY DEGGER ASSOCIATES, INC., HARRISBURG, PA, JUNE 1979.

LIST OF REFERENCES

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18. Roughness Characteristics of Natural Channels, H. H. Barnes, Jr., Geological Survey Water-Supply Paper 1849, Department of the Interior, United States Geological Survey, Arlington, Virginia, 1967.

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APPENDIX E

FIGURES

LIST OF FIGURES

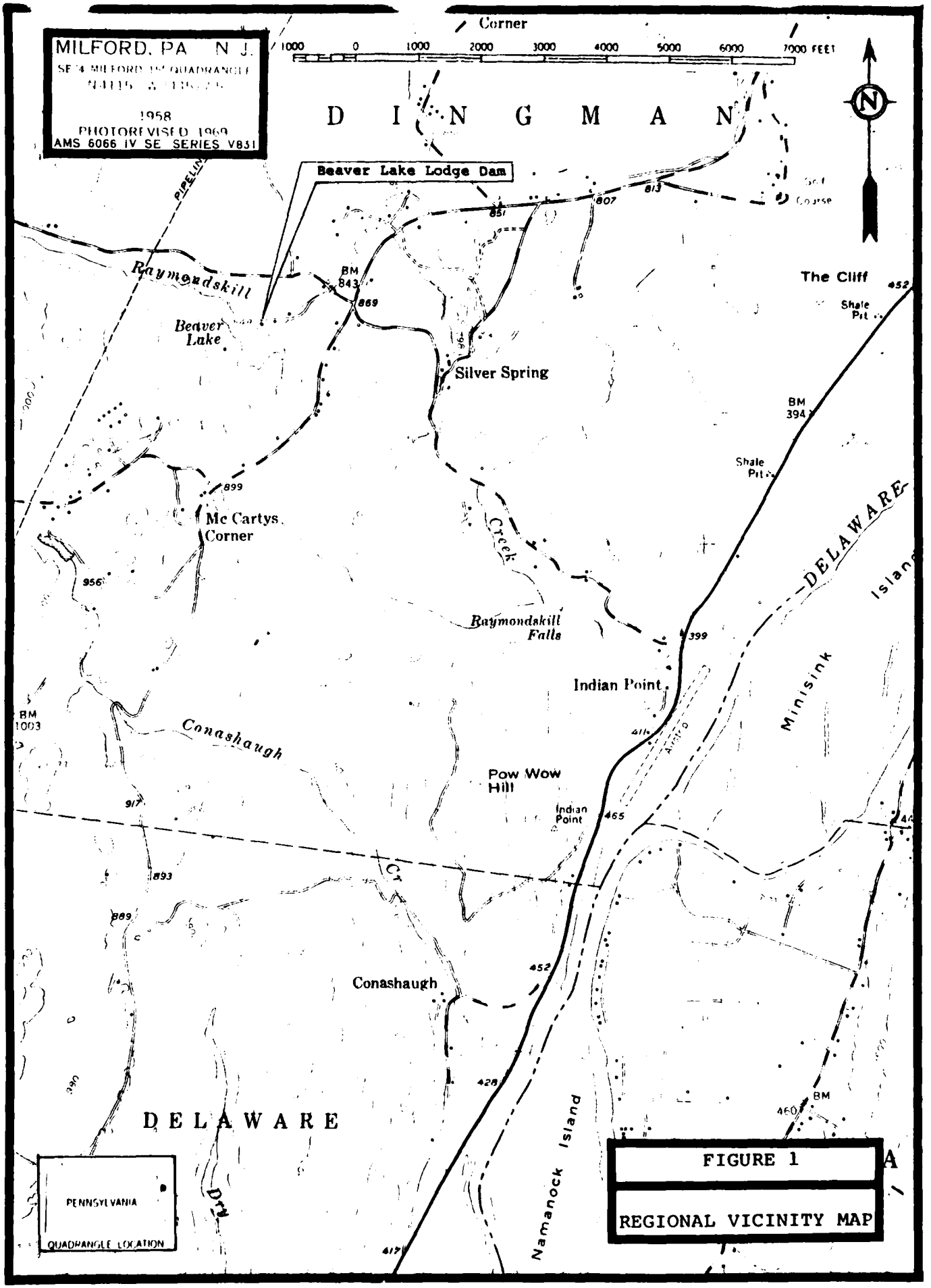


FIGURE 1

REGIONAL VICINITY MAP

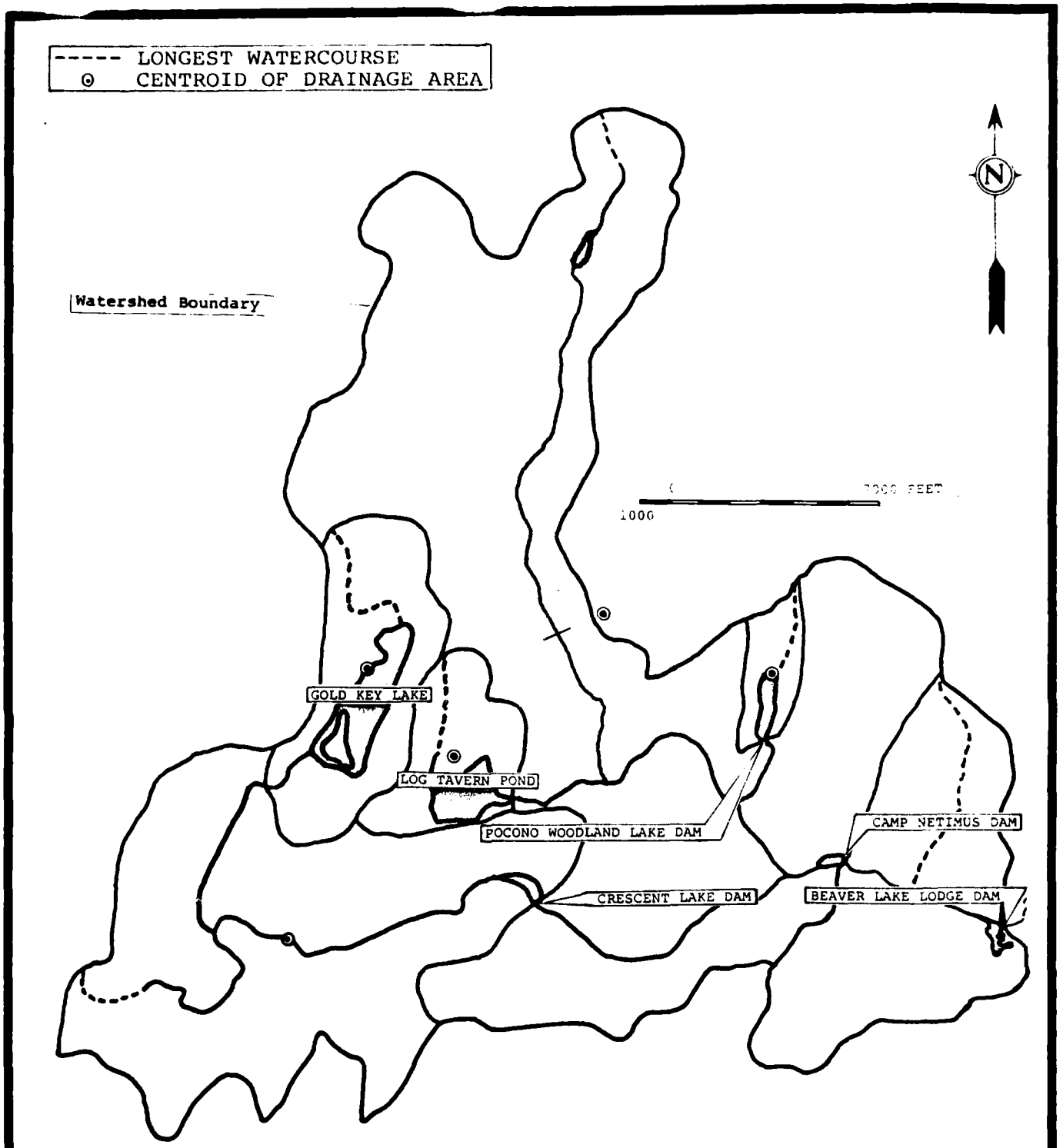


FIGURE 2

WATERSHED BOUNDARY MAP

APPENDIX F

GEOLOGY

Geology

Beaver Lake Lodge Dam is located in the glaciated Low Plateaus section of the Appalachian Plateaus physiographic province of eastern Pennsylvania. In this area, the Appalachian Plateaus province is characterized topographically by flat-topped, hummocky hills formed as a result of glaciation and subsequent stream dissection of nearly flat-lying strata. The Devonian age sedimentary rock strata in Pike County regionally strike N35°E and dip gently to the northwest. The Delaware River is the major drainage basin in the area. Major tributary streams intersect the Delaware River at right angles; whereas, smaller streams display a slightly more random tributary pattern. Both major and minor tributary stream systems are joint controlled and exhibit modified rectangular and trellis-type drainage patterns.

Structurally, the area containing Pike County lies on the south flank of a broad, asymmetrical synclinorium that plunges to the southwest. Superimposed on this broad structural basin are numerous anticlinal and synclinal folds characterized by planar limbs and narrow hinges. Due to prior glaciation, low relief and surficial soil cover, fold axes are difficult to trace.

The sedimentary rock sequences in the vicinity of the dam and reservoir are probably members of the Susquehanna Group of Upper Devonian age (see Geology Map). The sedimentological changes observed in the Catskill Formation indicate that the rate of sedimentation exceeded the rate of basin subsidence, resulting in a facies change from marine to non-marine strata. On the accompanying geology map the delineation between the Middle and Upper Devonian age sedimentary rock sequences represents the Allegheny Front, which separates the Valley and Ridge physiographic province from the Appalachian Plateaus physiographic province.

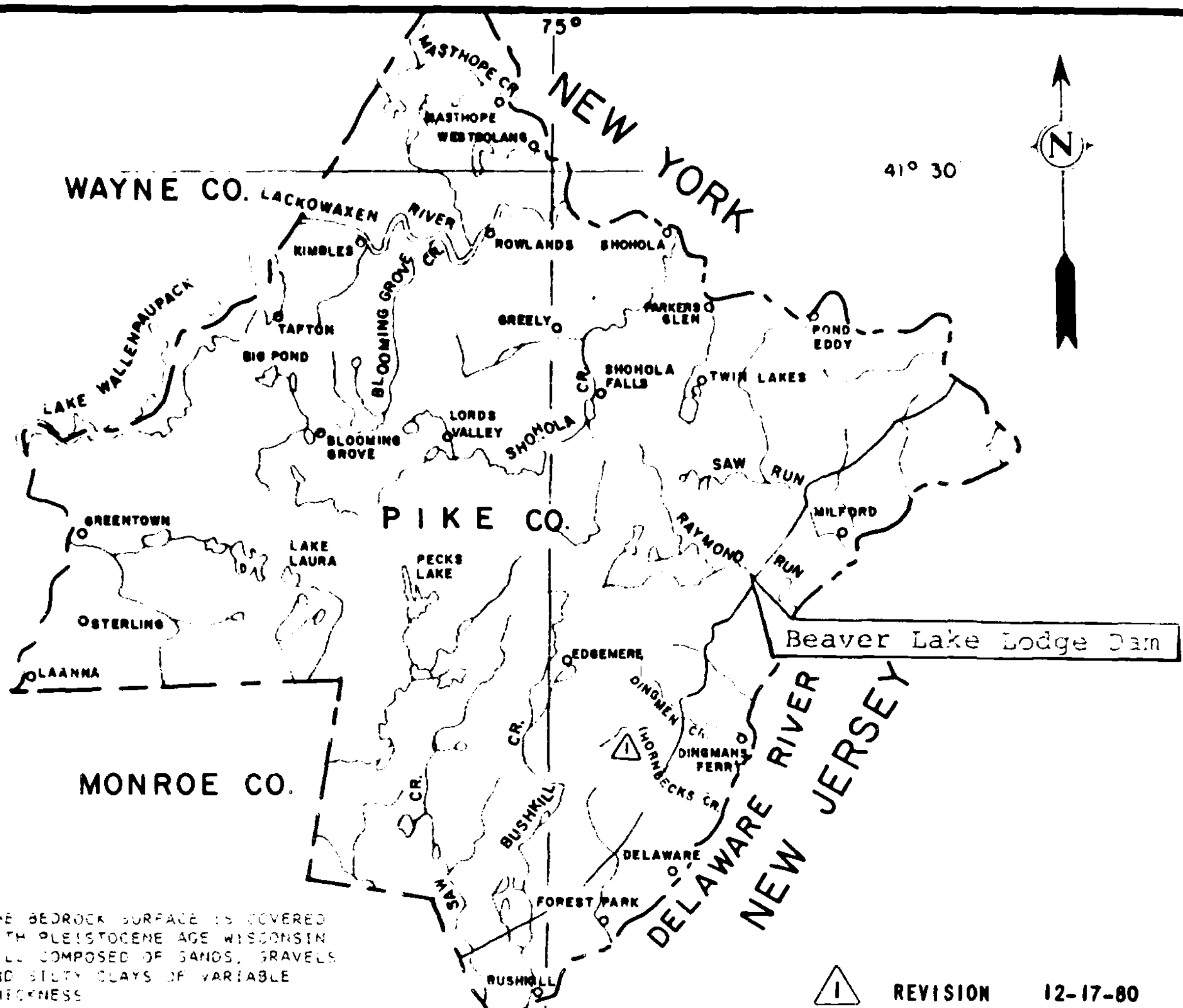
Approximately half of Pike County, including the dam site, is covered by a blanket of Wisconsin age (most recent) glacial drift which, based on the degree of weathering, was probably deposited during the Woodfordian stage. Valley bottoms are typically covered by recent alluvium and Woodfordian outwash of variable thickness, but typically less than 10 feet. These deposits are characteristically unconsolidated stratified sand and gravel, usually with more gravel than sand and some small boulders. The direction of the Wisconsin ice advance was from the northeast over the Catskill Mountains and from the north over the Appalachian Plateau. The terminal moraine resulting from the southern most advance of the Wisconsin ice sheet in this area is located in the southern portion of Monroe County, which borders Pike County to the South.

References:

1. Fletcher, F. W., Woodrow, D. L., "Geology and Economic Resources of the Pennsylvania Portion of the Milford and Port Jervis 15 minute U.S.G.S. Topographic Quadrangles," Pennsylvania Geological Survey, Fourth Series, Harrisburg, Atlas 223, 1970.

2. Sevon, W. D., Berg, T. M., "Geology and Mineral Resources of the Skytop Quadrangle, Monroe and Pike Counties, Pennsylvania", Pennsylvania Geological Survey, Fourth Series, Harrisburg, Atlas 214A., 1978.

3. Sevon, W., Personal Communication, Commonwealth of Pennsylvania Department of Environmental Resources, Harrisburg, December 3, 1980.



NOTE: THE BEDROCK SURFACE IS COVERED WITH PLEISTOCENE AGE WISCONSIN TILL COMPOSED OF SANDS, GRAVELS AND SILTY CLAYS OF VARIABLE THICKNESS

⚠ REVISION 12-17-80

LEGEND

UPPER DEVONIAN — SUSQUEHANNA GROUP

Catskill Formation – *Shohola Member* [illegible] *very fine to medium-grained sandstone* [illegible] *sandy shale* [illegible] *and shale. Sandstones are predominantly low-rank graywackes,* [illegible] *have simple or planar sets of small to medium-scale, generally* [illegible] *with shale units are abruptly disconformable to gradational.* [illegible] *thinly laminated and well cleaved. Mud cracks, convolute bedding,* [illegible] *with sandstone units. Member is more than 2,000 feet thick.* [illegible] *at top of highest red bed of the underlying Analomink. Analomink* [illegible] *Member,* [illegible] *silty, micaceous, finely laminated well-cleaved shale containing* [illegible] *and silty very fine grained sandstone. Unit is the "first red"* [illegible] *member is about 100 feet thick. Lower contact is gradational and* [illegible] *Delaware River Flags Member, grayish-green,* [illegible] *shale. Beds range from a few inches to as much as 4 feet thick.* [illegible] *contain no marine fossils. Member is about 300 feet thick.* [illegible]

MIDDLE DEVONIAN — HAMILTON GROUP

Mahantango Formation – *Upper member medium-dark-gray,* [illegible] *silty shale; member is about 700 feet thick and is separated from* [illegible] *"* [illegible] *,"* *a calcareous siltstone* [illegible] *containing abundant* [illegible] *lower member, virtually same lithology as upper member.* [illegible] *gradational*

Marcellus Shale – *Dark-gray,* [illegible] *laminated,* [illegible] *contains very hard lime concretions and is well cleaved,* [illegible] *Member is about* [illegible] *feet thick. Lower contact is gradational.*

SCALE

0 | 6 | 12 | 18 MILES

REFERENCE:
GEOLOGIC MAP OF NORTHEASTERN PENNSYLVANIA. COMPILED BY GEO. W. STOSE AND O.A. LJUNGSTEDT COMMONWEALTH OF PENNSYLVANIA DEPT. OF INTERNAL AFFAIRS DATED 1932. SCALE 1" = 6 MILES.

GEOLOGY MAP

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